

# The Carnegie Institution of Washington

Founded by Andrew Carnegie

*Scope & Organization*

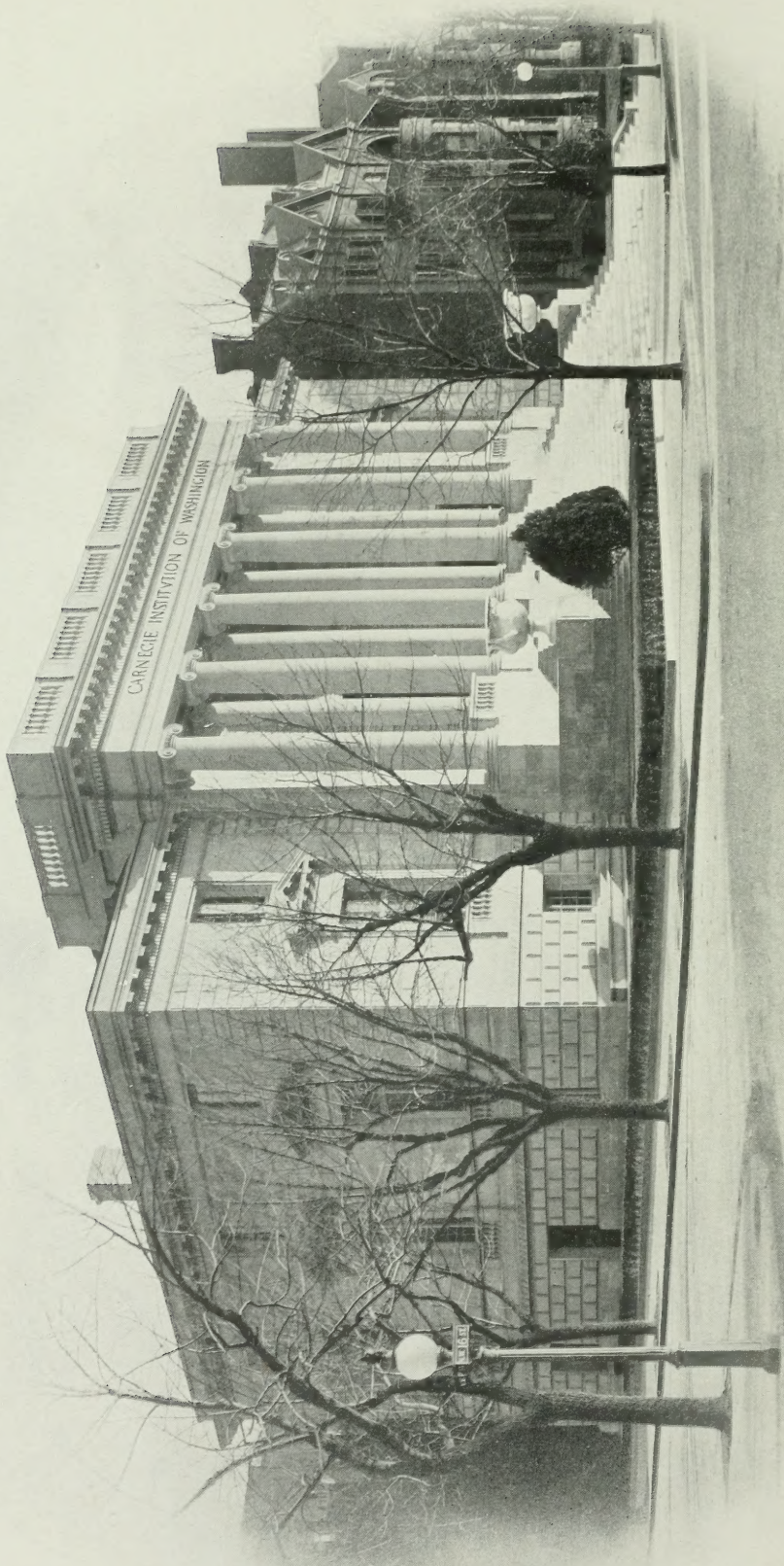
“To encourage in the broadest and most liberal manner  
investigation, research, and discovery, and  
the application of knowledge to the  
improvement of mankind.”











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## SCOPE AND ORGANIZATION



Fourth Issue, February 4, 1915



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\*Deceased.

Besides the names enumerated above, the following were ex officio members of the Board of Trustees under the original charter, from the date of organization until April 28, 1904:

The President of the United States.

The President of the Senate.

The Speaker of the House of Representatives.

The Secretary of the Smithsonian Institution.

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## PRESENT ORGANIZATION.

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ROBERT S. WOODWARD, *President.*

### BOARD OF TRUSTEES.

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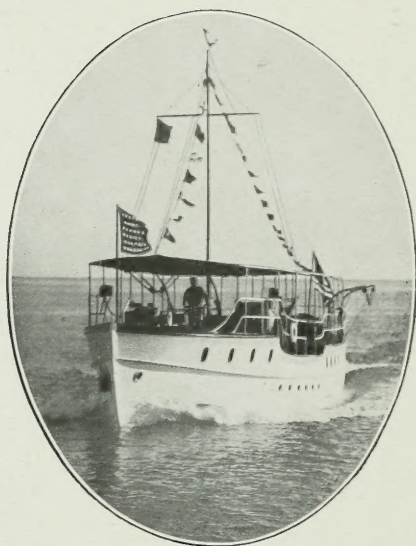
EXECUTIVE COMMITTEE: WILLIAM H. WELCH, *Chairman*; CLEVELAND H. DODGE,\* WM. BARCLAY PARSONS, HENRY S. PRITCHETT, ELIHU ROOT,\* CHARLES D. WALCOTT, HENRY WHITE, ROBERT S. WOODWARD.\*

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\*Member ex officio of Executive Committee.





## PLAN AND SCOPE OF THE INSTITUTION.

The Carnegie Institution of Washington was founded by Andrew Carnegie on January 28, 1902, when he gave to a board of trustees an endowment of registered bonds of the par value of ten million dollars; to this fund he added two million dollars on December 10, 1907, and ten million dollars on January 19, 1911; so that the present endowment of the Institution has a par value of twenty-two million dollars, yielding an annual interest of five per

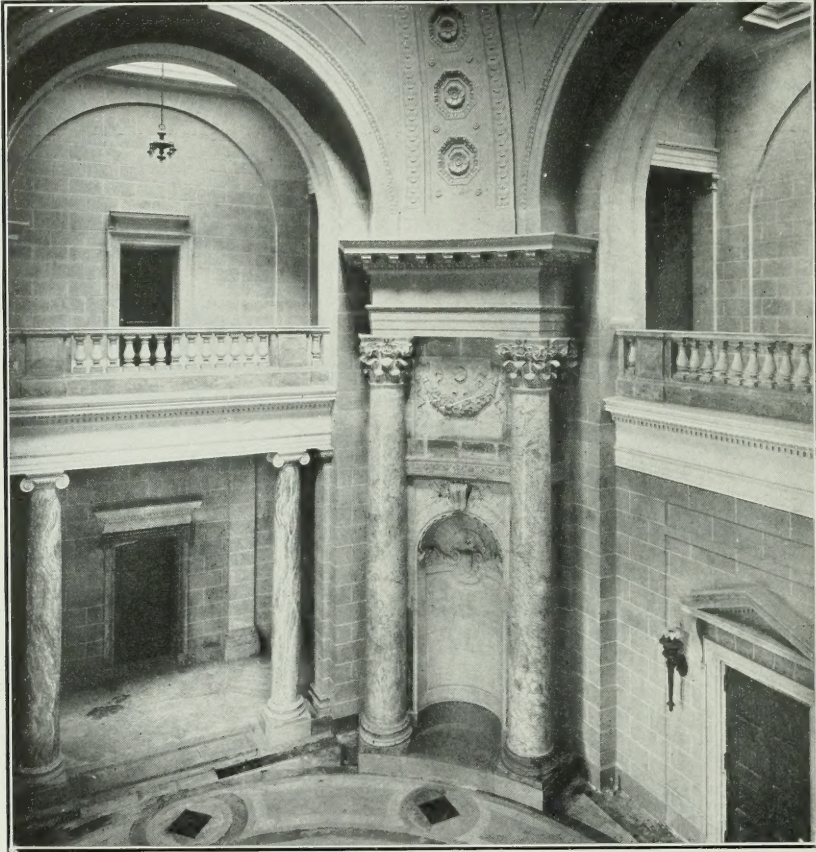


Board Room in Administration Building.

cent on this amount. The Institution was originally organized under the laws of the District of Columbia and incorporated as the Carnegie Institution, but was reincorporated by an act of the Congress of the United States, approved April 28, 1904, under the title of The Carnegie Institution of Washington.

Organization under the new Articles of Incorporation was effected May 18, 1904, and the Institution was placed under the

control of a board of twenty-four trustees, all of whom had been members of the original corporation. The Trustees meet annually in December to consider the affairs of the Institution in general, the progress of work already undertaken, the initiation of new projects, and to make the necessary appropriations for the ensuing year. During the intervals between the meetings of the Trustees



A View of the Rotunda, Administration Building.

the affairs of the Institution are conducted by an Executive Committee chosen by and from the Board of Trustees and acting through the President of the Institution as chief executive officer.

The Articles of Incorporation of the Institution declare in general "that the objects of the corporation shall be to encourage



in the broadest and most liberal manner investigation, research, and discovery, and the application of knowledge to the improvement of mankind." Three principal agencies to forward these objects have been developed. The first of these involves the formation of departments of research within the Institution itself, to attack larger problems requiring the collaboration of several



Another View of the Rotunda, Administration Building.

investigators, special equipment, and continuous effort. The second provides means whereby individuals may undertake and carry to completion investigations not less important but requiring less collaboration and less special equipment. The third agency, namely, a division devoted to editing and printing books, aims to



provide adequate publication of the results of research coming from the first two agencies and to a limited extent also for worthy works not likely to be published under other auspices.

Summarily, the work of the Institution may be classified under the heads of a Division of Administration, a Division of Publications, Departments of Research, and a Division of Research Associates. The Division of Administration consists of nine persons and is charged with the executive, financial, and correspondence duties of the Institution. The Division of Publications consists of three members permanently employed, and has charge of the work of editing and printing books. Temporary assistance in connection with illustrations, proof-reading, etc., is also employed by this division as needed. The staffs of these two divisions are given on page 9. The Institution has thus far established eleven of the larger departments of research; their designations, the names and addresses of their Directors, the investigatory staffs, and brief indications of their origin, development, and present status are given in the following pages. Many grants have been made in aid of minor projects for investigation, and many Research Associates and collaborators, connected mostly with colleges and universities, have been and are carrying on work also under the auspices of the Institution.

A condensed history of the origin, development, and growth of the Institution will be found in the President's Report contained in the Year Book for 1911, which also gives lists of all persons who had been engaged up to that time in the work of the Institution from the time of its organization. A more comprehensive view of this history may be gained from the contents of the Year Books and from the other more formal publications issued by the Institution. General and classified lists of these publications may be had on application, and the publications themselves may be found in nearly all of the greater libraries of the world. About three hundred volumes have been issued up to date.

The executive offices of the Institution are in its Administration Building, on the southeast corner of Sixteenth and P streets, northwest, Washington, D. C. This building is constructed of Bedford limestone, is three stories in height, and has an available floor space of about 21,000 square feet. The basement is devoted

chiefly to file rooms and to rooms for the receipt, shipment, and storage of the publications of the Institution, with fireproof vaults and shelving provided for such storage. The second floor is supplied with board and committee rooms for the use of the Trustees and the Executive Committee, and with an Assembly Room having a seating capacity for about two hundred persons. The third floor has twelve rooms, furnishing adequate quarters for the Division of Administration and the Division of Publications.

#### DIVISION OF ADMINISTRATION.

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EDWARD B. FRISTOE, Clerk.

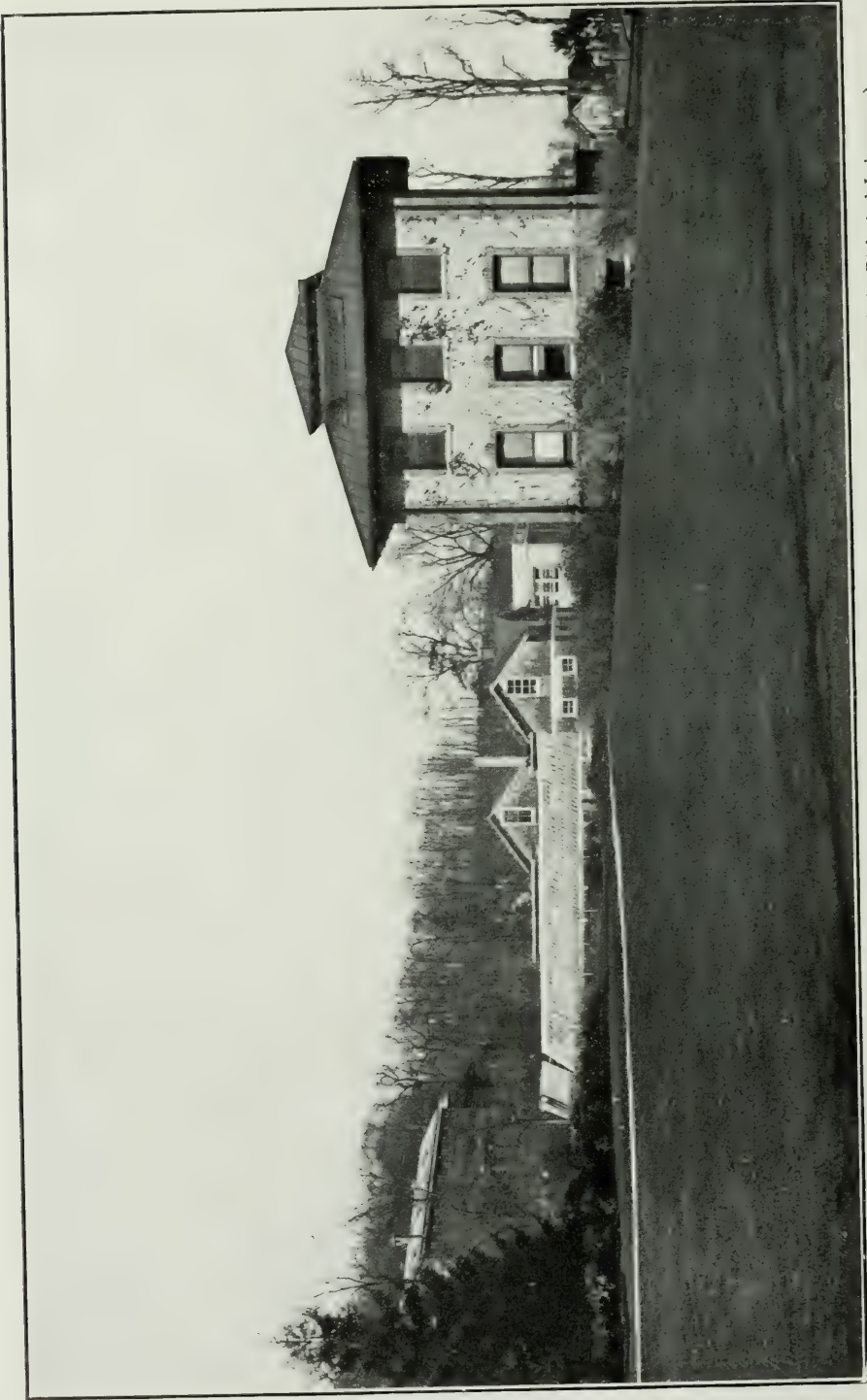
#### DIVISION OF PUBLICATIONS.

WILLIAM BARNUM, Editor.

FLORENCE F. STILES, Proof-reader.

CHARLES J. STODDARD, Clerk.





Main Building at Station for Experimental Evolution, with Associated Buildings—from left to right Blackford Hall (of the Biological Laboratory), Greenhouses, corner of Animal House, Laboratory, Boat House.



## DEPARTMENT OF EXPERIMENTAL EVOLUTION.

*Director,* CHARLES B. DAVENPORT.

*Address,* Cold Spring Harbor, Long Island, New York.

### PRESENT INVESTIGATORY STAFF.

ARTHUR M. BANTA.  
CHARLES W. METZ.

J. ARTHUR HARRIS.  
OSCAR RIDDLE.

E. C. MACDOWELL.  
GEORGE H. SHULL.

Research in biology was one of the first subjects to receive consideration from the Institution, and in December 1903 a plan for a station devoted to experimental evolution, submitted by Professor Davenport, was approved. Early in 1914 a tract of land, of about ten acres, at Cold Spring Harbor, Long Island, New York, was leased



A Bed of *Oenotheras* for the Study of Mutations.

from the Wawepex Society for a term of fifty years; the erection of a main laboratory was soon begun, and the station was formally opened June 11, 1904, with Professor Davenport as Director. In January 1906, the official designation of Department of Experimental Evolution was adopted.

The buildings used by the Department comprise the main laboratory and office building, the animal house, Director's resi-

dence, greenhouses, pigeon houses, cat house, and a house on Goose Island, together with some minor buildings. For use in marine collecting a naphtha launch is provided.

In studies in the theories of heredity, use has been made of sheep, goats, cats, rats, poultry, canaries, pigeons, and various insects (beetles of several species, flies, and crickets), beans, Bursa, Oenothera, sunflowers, maize, poppies, *Lychnis*, *Fraxinus*, etc.; and such topics as dominance, factorial composition of characters, the presence of genotypes in species, the effect of selection, the relation between somatic structure and chromosomes, the combination of



View in garden at Station for Experimental Evolution. Indian Corn, showing bags for guarding ears and collecting pollen from the tassel.

various other characters with sex, the modification of sex-behavior, the direct influence of conditions upon the germ-plasm have received special consideration. In the field of modification of characters, investigations have been made upon the effects of altering the conditions of temperature and light (in cave studies) under which animals develop. Studies of the chemical nature of inheritable characters and on the ontogenesis of positive and negative characters are being carried out. The study of heredity in man is proceeding in association with the Eugenics Record Office, which has been established near by to supply adequate cooperation.

On April 5, 1909, the Institution purchased for the Department of Experimental Evolution a small island in Long Island Sound, known as Goose Island, for conducting investigations on plants and animals in a state of isolation. In 1910, through the generosity of Cleveland H. Dodge, there were built on this island a wharf 70 feet long and a rubble house of one room, 9 by 14 feet.



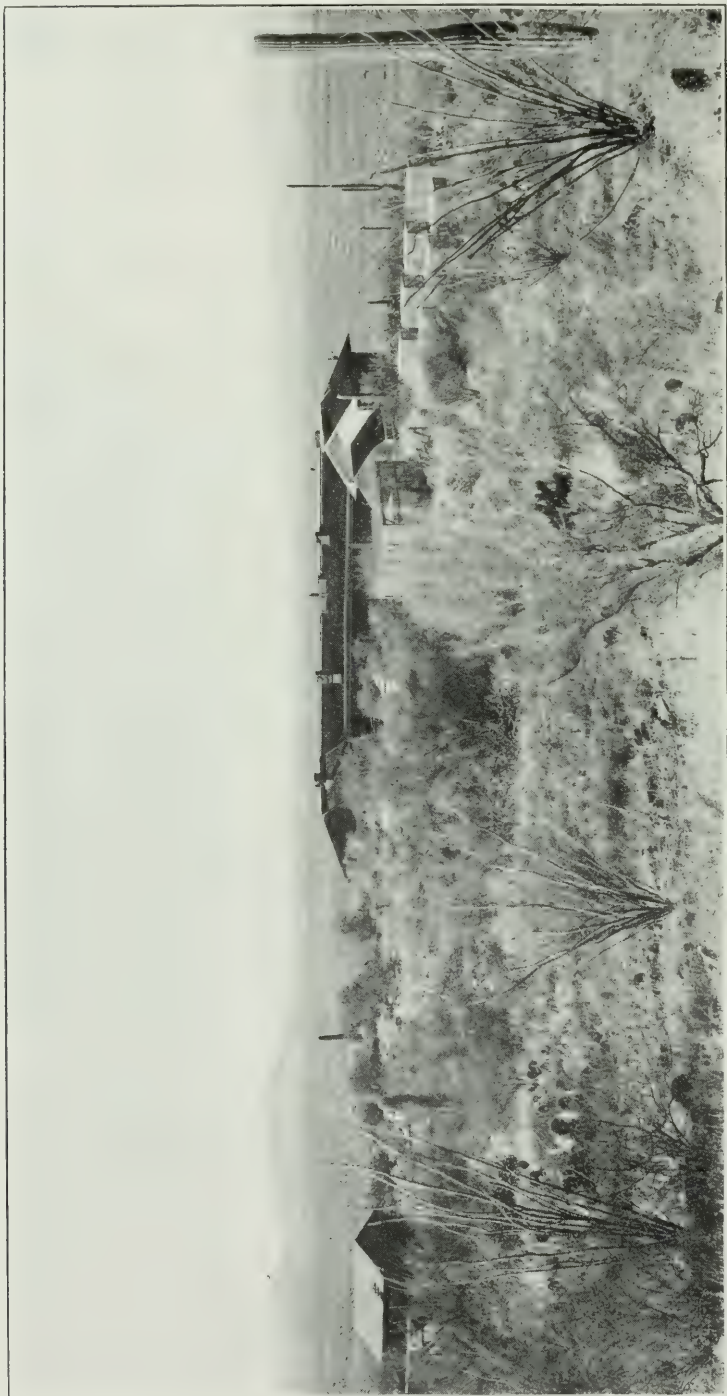
Buildings at Station for Experimental Evolution: From left to right, Animal House, Pigeon Houses, Greenhouses, and Laboratory in the background. View looking southeast.



Front View of Animal House at Cold Spring Harbor.

Besides the tract that is leased, the Institution owns a tract of 21 acres, purchased February 1910, lying within a mile of the Station; about 15 acres are wooded and the rest is used as an experimental garden. About 8 acres additional are leased near the Station for gardens and for the poultry experiments.





Main Building, Desert Laboratory, Tucson, Arizona.

## DEPARTMENT OF BOTANICAL RESEARCH.

*Director*, D. T. MacDOUGAL.

*Address*, Desert Laboratory, Tucson, Arizona.

### PRESENT INVESTIGATORY STAFF.

WILLIAM A. CANNON.

FORREST SHREVE.

H. A. SPOEHR.

G. SYKES.

This Department was formally established December 12, 1905. Three years previously, however, the Board of Trustees of the Institution authorized the construction of a laboratory at Tucson, Arizona, for the special needs of botanical research in desert areas. This laboratory was completed during the year 1903, in accordance with plans drawn up by Mr. F. V. Coville and Dr. D. T. MacDougal, who served as an advisory committee on the conduct of work at the laboratory until the present organization was effected.

At Tucson the Department has the following buildings: Main laboratory, photo-chemical laboratory, shops, and three water reservoirs. On experimental grounds in the valley of the Santa Cruz River are situated an office and laboratory of adobe and brick. At Carmel, California, operations are conducted in a frame office and frame laboratory, the latter being a gift from the Carmel Development Company.

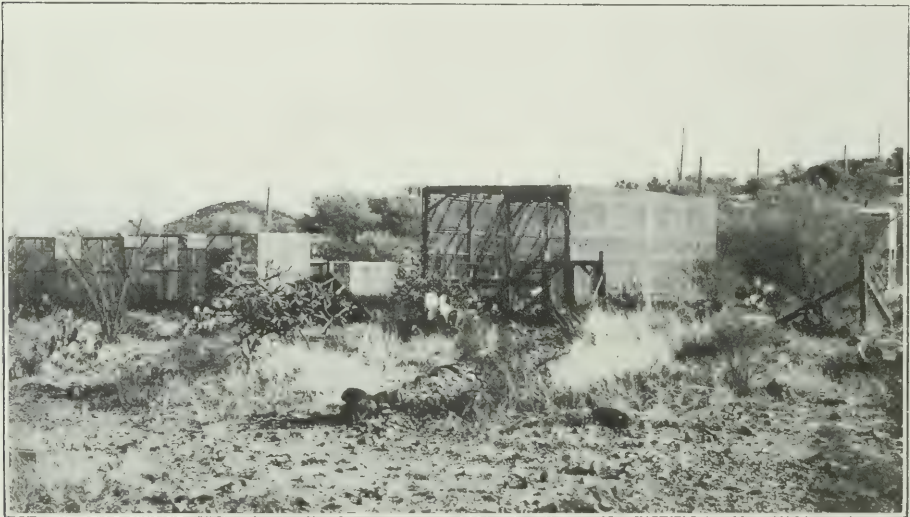
The situation of Carmel on the Pacific Coast is especially useful for the extension of the investigations of the Department upon the reactions of organisms to environmental agencies. The main laboratory at Tucson is located in a land reservation of about 863 acres, bearing characteristic desert vegetation. In addition, the Department has reservations for plantations in the Santa Catalina Mountains of Arizona and stations for experimentation at various points in the desert areas of the Southwestern States. The altitudes of these reservations and stations range from below sea-level at Salton Sea, California, to 8,000 feet in the Santa Catalina Mountains, Arizona.

The chief researches of the Department have been concerned with a group of connected problems in the phyto-chemistry, water-relations, and environic reactions of plants. Contributions have been made to the subjects of dissemination and distribution of desert plants, origination and fate of plant populations, root-habits of plants, soil moisture and evaporation, evaporation as a limiting

factor in determining the general character of the vegetation of a region, the mechanics of stomatal action and transpiration, the water-balance of plants in desert regions, and variations in heredity induced by ovarial treatments with various substances.

Some progress has been made in the study of respiration and acidity of sap in connection with photolysis and the reduction of water and bicarbonates.

Special attention has been given to the phenomena of aridity in desert basins occupied by intermittent or fluctuating lakes, the interest centering on Salton Lake, formed in 1905, and now receding at a rate of 50 inches in depth yearly. Travertine forma-



Acclimatization Shelter, Tumamoc Hill, Arizona.

tion, initial changes in woods in fossilization, the accommodation of organisms to concentrating brines, the changes in lacustrine deposits incident to aridity, and the mechanics of revegetation of emersed areas are subjects to which contributions have been made.

The climatic factors of the continent have received careful treatment by an associate, while progress has been made in meteorological subjects of special importance in plant-geography. The principles underlying plant successions and formations are being formulated on the basis of results obtained, while much attention is being devoted to the Cactaceæ, a family of desert succulents characteristic of the deserts of North and South America.



## DEPARTMENT OF EMBRYOLOGY.

*Director*, FRANKLIN P. MALL.

*Address*, Johns Hopkins Medical School, Baltimore, Maryland.

### PRESENT INVESTIGATORY STAFF.

FRANZ KEIBEL.  
H. M. EVANS.

G. L. STREETER.  
M. REICHER.

A grant in aid of embryological research was made in the spring of 1913 to Professor Franklin P. Mall, who took immediate steps to organize a laboratory of sufficient magnitude to carry on selected problems of broad scope, particularly such as are beyond the reach of a single individual. During 1913 and 1914 he associated with him for this work the staff named above.

On December 11, 1914, the establishment of a Department of Embryology was authorized by the Board of Trustees and Professor Mall was appointed Director. Researches at present are being carried on in a suite of rooms in the Anatomical Laboratory of the Johns Hopkins University and its facilities thus available are unusually advantageous for embryological investigation. Competent support has been secured from scientific assistants, specially trained technicians, artists, and modelers.

During the past year Dr. Mall has transferred to the Institution his embryological collection, the result of his unceasing efforts during the past twenty-seven years. It consists of over 1,000 human specimens, many of which have been prepared in permanent serial sections. The collection is already unique in both magnitude and importance, but a vigorous effort is being made to still further increase it. It is now safely housed in fire-proof rooms, together with the original data, drawings, photographs, and clinical records, which are second in importance only to the specimens themselves. Convenient classified lists and a card catalogue have been prepared to render all of this material easily available.

Under general embryology, work is progressing to establish a norm for the external form of embryos under 25 millimeters long, together with a division of this period into stages, and physico-anthropologic measurements are being made to extend this work to older fetuses. This will add greater precision to the determination of the age of embryos and will help explain anatomical variations

and the characteristics in racial anatomy. Considerable attention is being directed to the pathological aspects of embryology and their bearing on fertilization, duration of pregnancy, and the causes of abortion and sterility. A study of the fate of the ovum in tubal pregnancy is now in press.

The structural anatomy of the embryo at different stages is being studied. Models and drawings have been finished of embryos between 2 and 4 millimeters. A study of the development of the muscles of the head region is nearly completed. A monograph on the structure of the medulla oblongata has been published. A study of the development of the abdominal veins is practically ready for publication, making an important link in the series of investigations on the formation of the vascular systems which have been under way for the past three years. A volumetric study of the embryo brain is nearing completion and also a study concerning the drainage of the developing membranous labyrinth. Among the cytological studies mention should be made of the papers recently published regarding the behavior of somatic cells toward vital stains.



The New Laboratory and the Path at Tortugas, July 1914.

## DEPARTMENT OF MARINE BIOLOGY.

*Director, ALFRED G. MAYER.*

*Address, Princeton, New Jersey.*

This Department was formally authorized in December 1903. Its principal laboratory is situated upon Loggerhead Key, Tortugas, Florida, but temporary branch laboratories have been from time to time established at Nassau and at Andros Island (in the Bahamas), in Jamaica, and upon Murray Island, Torres Straits, Australia. The Tortugas laboratory is now one of the best-equipped tropical marine stations of the world.



The Anton Dohrn at Tortugas, July 1914. The figure facing page 5 gives another view of the same vessel.

In addition to the principal buildings, which are 53 and 87 feet long respectively, the Department has at Tortugas an aquarium, dock, pumping station, and machine shop. Its principal vessel is the *Anton Dohrn*, a 70-foot yacht, but it also has three launches, the *Sea Horse*, *Vellula*, and *Henderson*.

The object of the Department is to pursue intensive studies upon problems of the tropical ocean, paying special attention to those of physiology, ecology, heredity, variation, and others



lying in the borderland between biology and pathology. Systematic zoology is not neglected, however, for monographs upon worms, tunicates, bryozoa, ctenophores, and medusæ have been published, and others are in course of preparation.

It is the aim of the Department to offer to distinguished investigators exceptional opportunities to pursue those researches for



Interior of the Tortugas Laboratory, July 1914.



A Glimpse of Bird Life, Tortugas.

which the tropics afford peculiar advantages. Thus problems of oceanography, the geology of marine limestones, the reactions of tropical sea gulls, and the mutations of island mollusks fall within the scope of the laboratory, and during the past ten years the greater part of the work upon the biology of the West Indian region has been carried on under the auspices or with the cooperation of the Department of Marine Biology.



Loggerhead Turtles, one day old, at Tortugas, Florida. At this stage the animals are about 2 inches in length.

Exclusive of preliminary papers and reports in Year Books, the Carnegie Institution of Washington has published 60 contributions, aggregating 2,551 pages and 269 plates, giving results of researches from the Department of Marine Biology; in addition, many papers have been published in current journals and elsewhere.

During the past ten years 49 investigators have made 108 visits to the laboratory, and many discoveries in biology and in geology have resulted from their studies.

## NUTRITION LABORATORY.

*Director,* FRANCIS G. BENEDICT.

*Address,* Nutrition Laboratory, Boston, Massachusetts.

### PRESENT INVESTIGATORY STAFF.

E. B. BABCOCK.	M. A. CORSON.	E. P. JOSLIN.	E. S. MILLS.
K. H. BROWN.	A. N. DARLING.	A. JOHNSON.	H. M. SMITH.
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P. H. COLBETH.	J. H. GALLYON, JR.	W. H. LESLIE.	J. I. WALDRON.
W. E. COLLINS.	H. L. HIGGINS.	W. R. MILES.	E. A. WILSON.



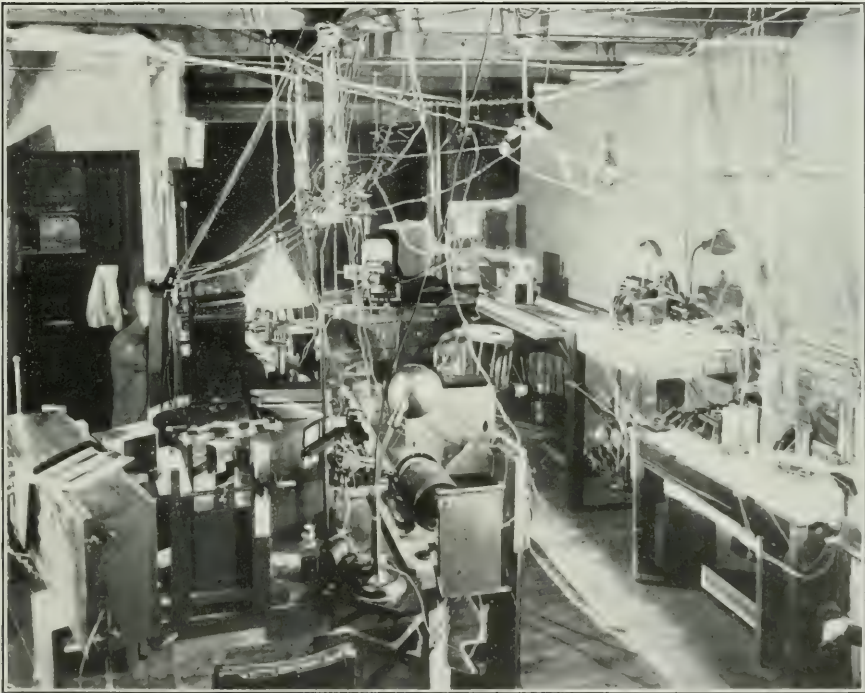
The Nutrition Laboratory, Boston.

The investigations in nutrition, to which this laboratory is devoted, originated with the late Professor W. O. Atwater, of Wesleyan University, Middletown, Connecticut. During the years 1903 to 1907 grants were made to him and to Professor Benedict to aid in building a respiration calorimeter and to carry on experi-



ments with this apparatus. The erection of a laboratory at Boston, Massachusetts, especially designed for this purpose, was authorized in December 1906, and early in 1907 Professor Benedict was appointed Director. The construction of the laboratory was begun in July 1907 and completed in February 1908.

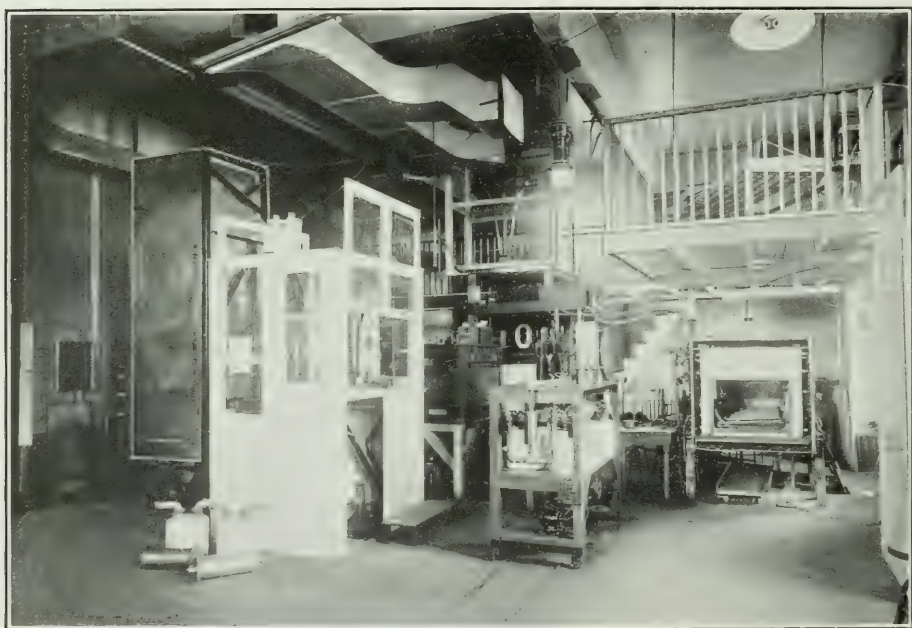
The experimental work of the Nutrition Laboratory, not only in the development of apparatus and technique, but in the accumulation of data, has progressed rapidly in the seven years since the laboratory was established.



Psycho-Physical Laboratory.

The equipment consists of a wide variety of apparatus for observations on metabolism and related investigations. It includes four respiration calorimeters, one of which is especially designed for studying the influence of muscular work; a number of forms of respiration apparatus of the unit type developed in this laboratory, together with other types of apparatus used by leading investigators for studying respiratory exchange; several respiration chambers for study of pathological cases, infants, and small animals; supplementary apparatus for recording muscular activity, respiration,

and pulse-rate; two bicycle ergometers and two treadmills for studying muscular work; various types of apparatus for photographic registration of pulse rate, respiration, electrical action of the heart, and other delicate physiological activities; an adiabatic bomb calorimeter; and a complete equipment for chemical analysis of foods and urine. A psychological laboratory has been fitted up for observations in physiological psychology, particularly with regard to the influence of various foods and drugs. Much of the scientific equipment has been developed in the Nutrition Laboratory and constructed in its own machine shop.

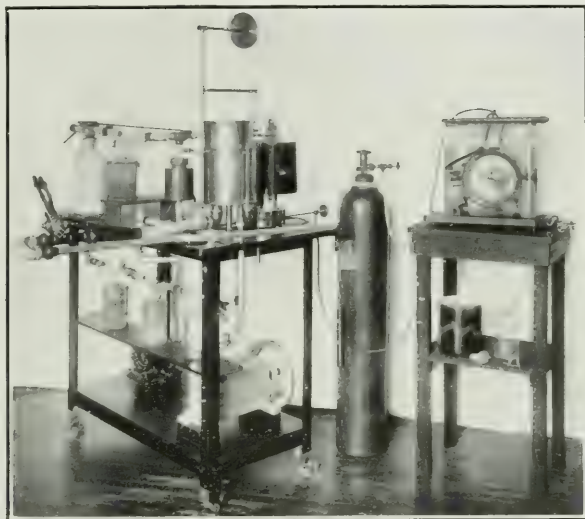


Interior showing Calorimeters and Accessory Apparatus.

The researches during the past seven years have included studies of the metabolism of normal individuals (both men and women), of infants, and of diabetics. Observations have also been made on the influence of various factors upon metabolism, as the ingestion of food and of special diets; the breathing of oxygen-rich atmospheres; temperature environment; muscular activity, particularly bicycle riding, walking, and running; pregnancy; fasting; obesity; therapeutic agents; and moderate doses of alcohol. Researches have been carried out with dogs to determine the influence on the metabolism of the removal of the hypophysis and of the

effect of feeding meat to dogs having no pancreas. A comparison has been made of direct and indirect calorimetry, the various methods for studying respiratory exchange have been compared, and the body-temperature has been topographically studied.

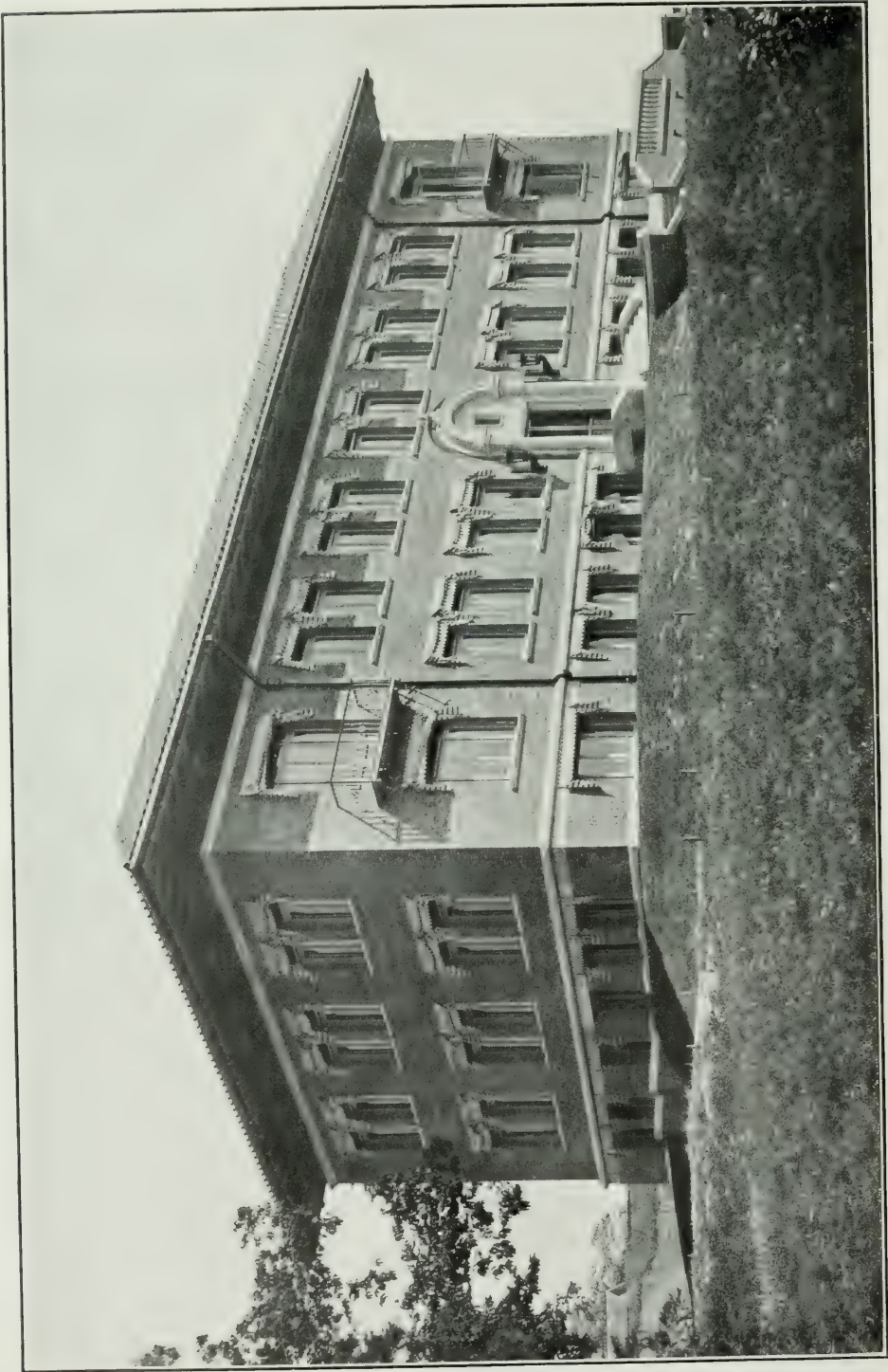
Aside from the regular chemical work connected with the other investigations, several special lines of research have been conducted, including studies on the composition of outdoor air, of the nutritive



Unit Respiration Apparatus, Nutrition Laboratory.

value of different servings of food, and on the exact determination of sugar in diabetic urine. The heats of combustion of a number of organic compounds have been determined and analyses have been made of various diabetic foods. Considerable Russian, Scandinavian, and Bohemian literature bearing on subjects studied in this laboratory has also been translated, thus making available to investigators the results of experimental work which would otherwise be difficult of access. A number of scientists, both American and European, have cooperated in the investigations of the laboratory.





Headquarters and Laboratory of Department of Terrestrial Magnetism, Washington, D. C.

## DEPARTMENT OF TERRESTRIAL MAGNETISM.

*Director, L. A. BAUER.*

*Address, 36th Street and Broad Branch Road, Washington, D. C.*

### PRESENT INVESTIGATORY STAFF.

J. P. AULT.	H. W. FISK.	S. J. MAUCHLY.	H. R. SCHMITT.
D. W. BERKY.	J. A. FLEMING.	W. C. PARKINSON.	W. F. G. SWANN
F. BROWN.	H. F. JOHNSTON.	W. J. PETERS.	W. F. WALLIS.
C. R. DUVAL.	E. KIDSON.	A. D. POWER.	J. A. WIDMER.
H. M. W. EDMONDS.	I. A. LUKE.	H. E. SAWYER.	D. M. WISE.
C. K. EDMUNDS.			



Observing on board the "Carnegie"; observers making declination observations in the after observatory and inclination observations in the forward observatory.

In 1902 Dr. L. A. Bauer submitted to the Institution a plan for a general magnetic survey of the earth, which was published in the Year Book for 1902. Work on this survey was begun in a tentative way in April 1904, Dr. Bauer being appointed Director of the Department. In December 1904, more extensive operations were authorized and preparations were made to fit out a vessel for a survey of the Pacific Ocean. For this purpose the brigantine *Galilee*, of San Francisco, was chartered, and it continued in the service from August 1905 until May 1908.

The success of the *Galilee* in securing observations of magnetic elements at sea led to the designing and to the construction of the non-magnetic ship *Carnegie*. She was launched June 12, 1909, and set sail August 21, 1909, on her first voyage. Her length

over all is  $155\frac{1}{2}$  feet; length on load water-line,  $128\frac{1}{3}$  feet; beam, 33 feet; draft,  $13\frac{1}{2}$  feet; displacement, 568 tons; sail area, 12,900 square feet. She is built of wood and of non-magnetic metals and, while primarily a sailing craft, brigantine-rigged, is provided with auxiliary propulsion by means of an internal-combustion engine, for which gas is supplied from a producer. Her novel equipment and freedom from magnetism permit making precise magnetic observations at sea, for navigational and scientific purposes, almost as readily as on land.



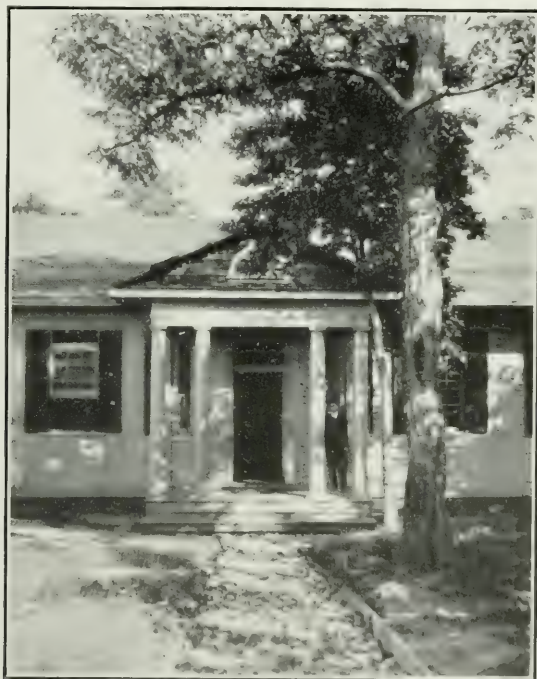
The Carnegie. Another view of this vessel may be seen facing page 45.

The work already accomplished by the Department may be summarized as follows: Ocean observations embracing the three magnetic elements (declination, dip, and intensity) on cruises in the Atlantic, Pacific, and Indian Oceans, aggregating about 171,000 miles, and covering all the oceans; similar observations on land at about 3,000 stations, distributed over 107 different countries and island groups, and located especially in regions where no magnetic results, or but an insufficient number, had been obtained previously. Determinations are made also, in the land and ocean work, of the



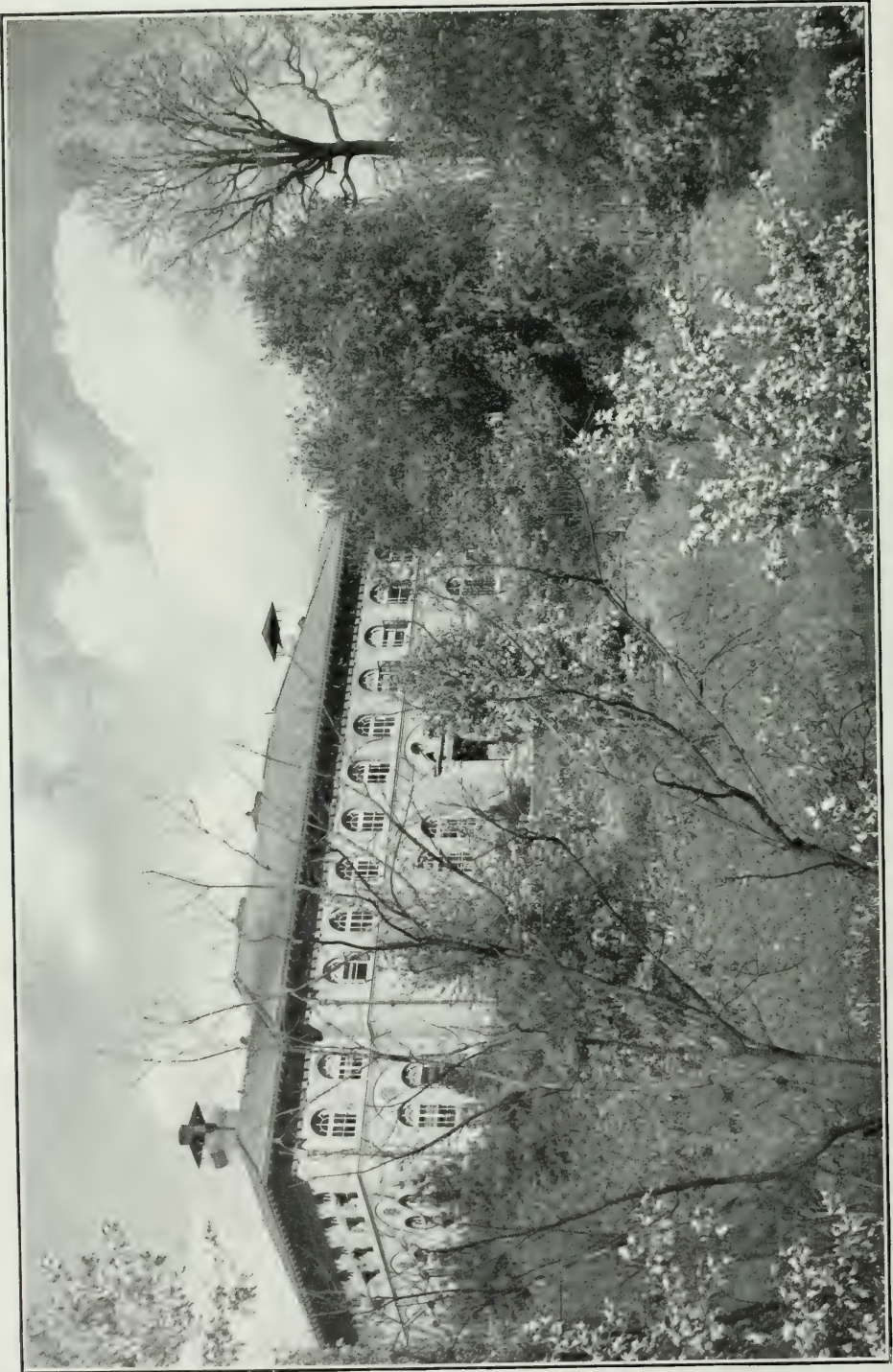
changes occurring in the magnetic elements, so that it will be possible to refer all the existing values of these elements to the same date. By January 1, 1915, a general magnetic survey of the globe will have been about three-fourths completed.

Besides work in terrestrial magnetism, this Department carries on researches in atmospheric electricity and allied subjects; also, in its laboratory at Washington, special experimental investigations are conducted on magnetism in general and kindred topics.



Standardizing Magnetic Observatory.

The necessity for permanent quarters for observational and laboratory facilities having become apparent, a site was purchased in the District of Columbia, near the National Rock Creek Park, and sufficiently removed from industrial disturbing influences. Here was erected a commodious fireproof building containing the Director's headquarters and rooms for the staff, library and archives, physical laboratory, instrument shop, etc. At a proper distance from the main building is located a one-story standardizing magnetic observatory. These buildings were completed in 1914.



The Geophysical Laboratory at Washington.

## GEOPHYSICAL LABORATORY.

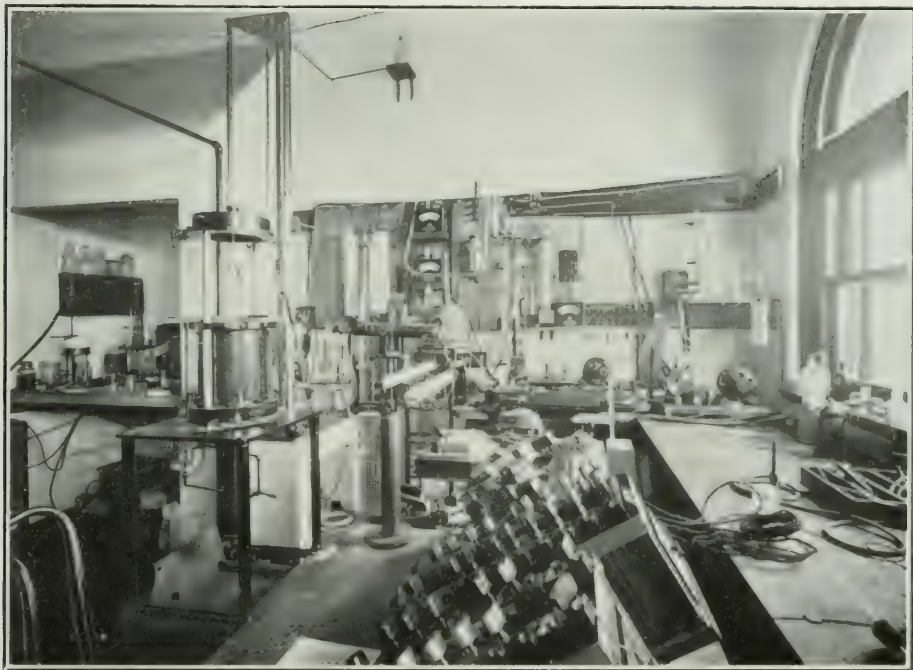
*Director, ARTHUR L. DAY.*

*Address, Geophysical Laboratory, Upton Street, Washington, D. C.*

### PRESENT INVESTIGATORY STAFF.

L. H. ADAMS.	C. N. FENNER.	G. W. MOREY.	H. S. WASHINGTON.
EUGENE T. ALLEN.	J. B. FERGUSON.	EUGEN POSNJAK.	WALTER P. WHITE.
OLAF ANDERSEN.	J. C. HOSTETTER.	G. A. RANKIN.	E. D. WILLIAMSON.
N. L. BOWEN.	JOHN JOHNSTON.	E. S. SHEPHERD.	FRED. E. WRIGHT.
J. L. CRENSHAW.	H. E. MERWIN.	ROBERT B. SOSMAN.	E. G. ZIES.

Investigations to determine the modes of formation and the physical properties of the rocks of the earth's crust were begun under the auspices of the Institution in 1904, when grants were



Laboratory equipped for Study of the Oxides of Iron.

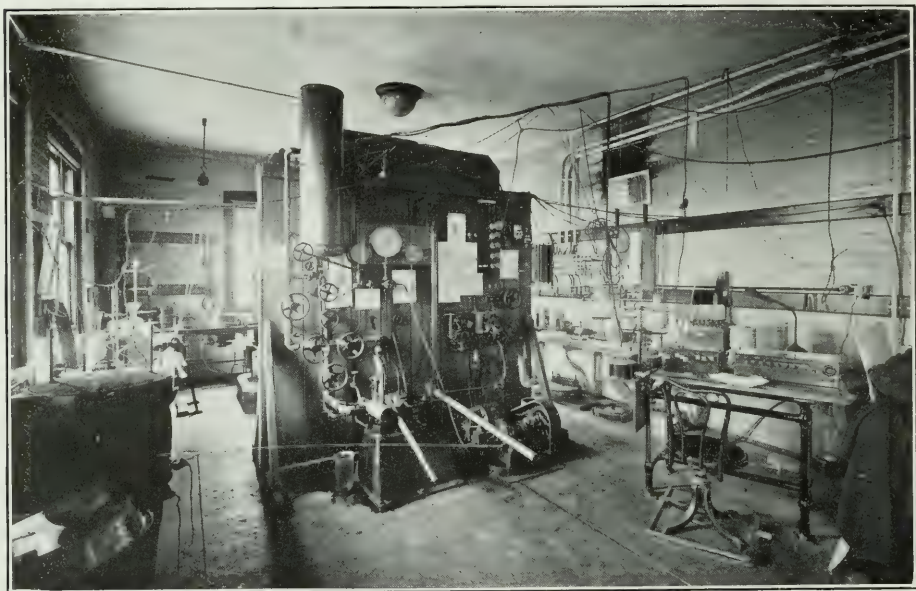
made for special researches carried on in Washington at the office of the United States Geological Survey.

In December 1905, estimates for the erection and equipment of a special laboratory for the experimental work previously carried on by Dr. Day were formally approved. A site of five acres on an



isolated hill, east of Connecticut Avenue, in the subdivision known as Azadia, District of Columbia, was purchased, and a contract for construction of the laboratory was let July 6, 1906. Dr. Day was appointed Director of the laboratory and he with his staff took possession of the completed building July 1, 1907.

This laboratory has many novel features of construction and equipment. It is especially well provided with apparatus for



Laboratory equipped for the Study of High Pressures and Temperatures.

chemical, physical, and optical work in mineralogy, and with apparatus for the study of materials subject to such high temperatures and high pressures as obtain in the formation of rocks and minerals in the earth's crust.

In October 1914, the publications of the Geophysical Laboratory numbered 200, contained mostly in representative American and foreign journals.

## DEPARTMENT OF MERIDIAN ASTROMETRY.

*Director*, BENJAMIN BOSS.

*Address*, Dudley Observatory, Albany, N. Y.

### PRESENT INVESTIGATORY STAFF.

S. ALBRECHT.	MABEL A. DYER.	HEROY JENKINS.	HARRY RAYMOND.
MARY E. BINGHAM.	ALICE M. FULLER.	BERTHA W. JONES.	ARTHUR J. ROY.
GRACE I. BUFFUM.	FLORENCE L. GALE.	ISABELLA LANGE.	W. B. VARNUM.
LIVIA C. CLARK.	S. B. GRANT.	FANNIE L. MACNEILL.	

An advisory committee on astronomy, of which Lewis Boss, Director of the Dudley Observatory, was chairman, recommended, in a report published in the Year Book of the Institution for 1903, the establishment of a temporary meridian observatory in the southern hemisphere, with the ultimate object of securing accurate measures of the positions of the stars visible in the southern hemisphere for use in connection with corresponding measures made at observatories in the northern hemisphere, in order to produce a complete catalogue of precision of all stars from the brightest down to those of the seventh magnitude, inclusive, for the entire celestial sphere. During 1904-05, special grants were made to Professor Boss, and in December 1905 the establishment of an observatory in the southern hemisphere was approved and the execution of the project was put in his charge. In March 1907 this branch of work was designated the Department of Meridian Astrometry, and Dr. Boss was formally appointed Director.

A Southern Observatory was located on national land belonging to the Escuela Regional in San Luis, in latitude south  $33^{\circ} 18'$ , longitude west  $4^{\text{h}} 25^{\text{m}} 25^{\text{s}}$ , on the East Andean plateau, at an altitude of about 2,500 feet. The buildings for the observatory and the quarters for the resident staff were erected during the winter of 1908-09. The instrumental equipment was supplied from the Dudley Observatory, Albany, New York, and the work of observing was begun in April 1909. This work was completed in January 1911, when the instrumental equipment was returned to Albany and observations were commenced on the northern stars. A subsequent expedition to San Luis, for the determination of the magnitudes of the stars observed, terminated in February 1913. The first fruits of the undertaking appeared in 1910, in the form of a "Preliminary General Catalogue of 6,188 stars for the Epoch 1900"; this volume has served as a basis for many studies of stellar motions.

Dr. Lewis Boss died in 1910 and was succeeded by Benjamin Boss.



Pasadena Office Building, Solar Observatory.



Quarters on Mount Wilson.



## MOUNT WILSON SOLAR OBSERVATORY.

*Director,* GEORGE E. HALE.

*Assistant Director,* WALTER S. ADAMS.

*Address,* Solar Observatory, Pasadena, California.

### PRESENT INVESTIGATORY STAFF.

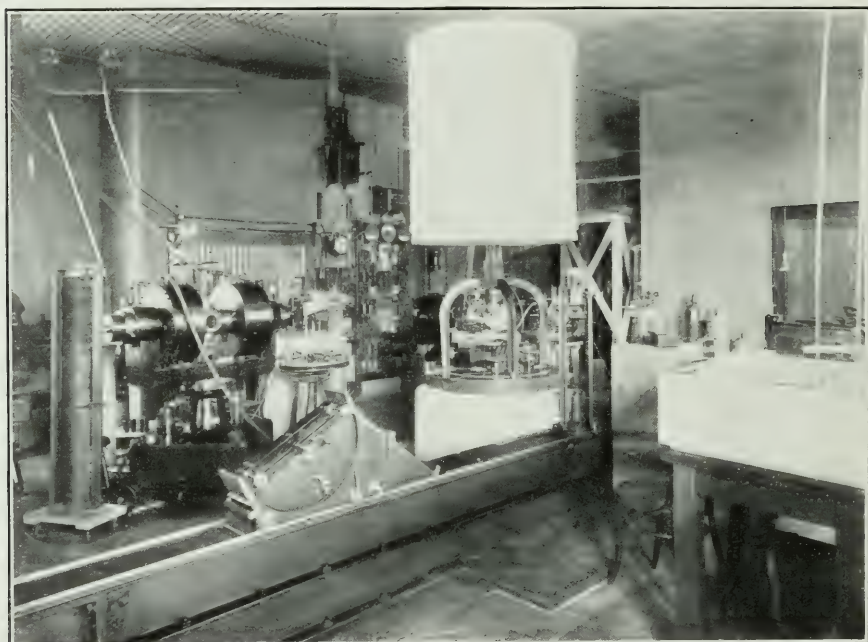
HAROLD D. BABCOCK.	HELEN HIGH.	GEORGE S. MONK.	RUTH E. SMITH.
DOROTHY BACH.	ARTHUR S. KING.	FRANCIS G. PEASE.	CHARLES E. ST. JOHN.
CORA G. BURWELL.	A. KOHLSCHÜTTER.	MYRTLE RICHMOND.	ADRIAAN VAN MAANEN.
R. S. CAPON.	JENNIE B. LASBY.	F. H. SEARES.	LOUISE WARE.
WALTER COLBY.	MERL M. McCLEES.	HARLOW SHAPLEY.	LAURA S. WEST.
HELEN DAVIS.	ADDIE MILLER.	BERTHA M. SHUMWAY.	CORAL WOLFE.
FERDINAND ELLERMAN.	ARDIS MONK.		



The Observatory on Mount Wilson.

The Solar Observatory has been developed from suggestions and recommendations made in a report from an advisory committee and published in the first Year Book of the Institution in 1902. The late Professor S. P. Langley, a member of this committee, urged especially the desirability of establishing such an observatory in some elevated subtropical locality. Professor George E. Hale, also a member of the committee, called attention likewise to the importance of additional direct studies of the sun and to their bearings on the more general problems of stellar evolution. He recommended particularly the construction of special telescopic

devices and the combination of an observatory with a physical laboratory. After testing the atmospheric and other conditions of various possible sites, it was determined in December 1904 to establish an observatory on Mount Wilson, near Pasadena, California, and Professor Hale was appointed Director of the enterprise. Mount Wilson is one of the summits of the San Gabriel range, 5,886 feet above sea-level, in north latitude  $34^{\circ} 13' 26''$  and in west longitude  $118^{\circ} 3' 40''$ . This site and the privileges of use and

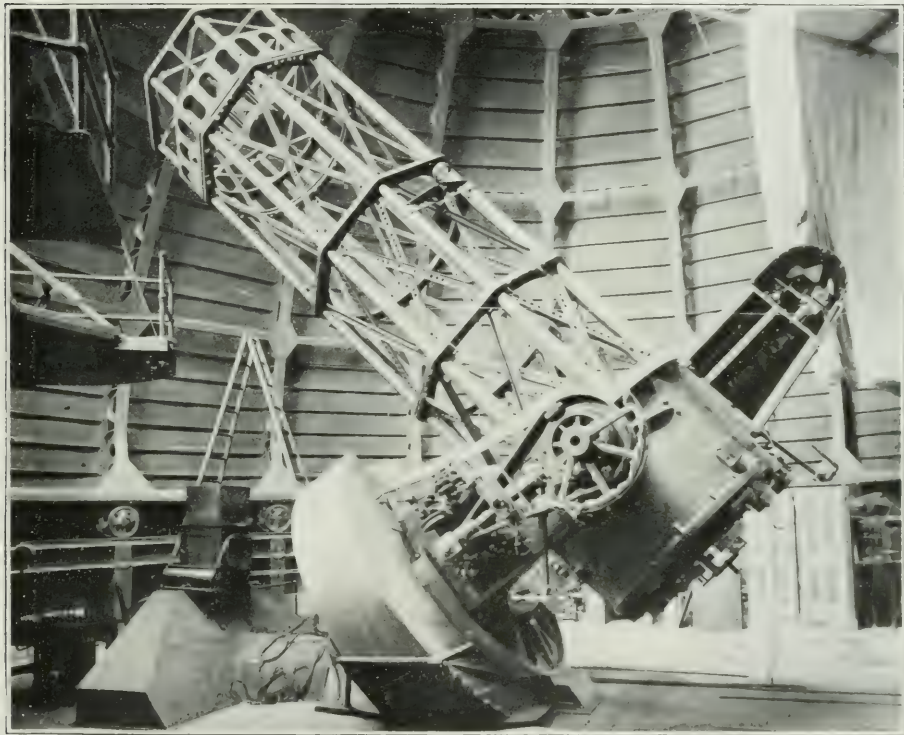


Laboratory at Pasadena.

improvement of the road leading to the mountain have been leased from the Mount Wilson Toll Road Company of Pasadena for a term of 99 years.

The establishment consists of two separate but closely related parts, namely, the observatory with its telescopic equipments and laboratory on Mount Wilson, and the office, shops, and physical laboratory in Pasadena. The office and the observatory, although about 16 miles apart, are in intimate connection by means of the telephone.

The observatory proper is equipped with the Snow horizontal reflecting telescope, purchased from the Yerkes Observatory; a tower (vertical) telescope 60 feet high; a tower telescope 150 feet high; and a reflecting telescope 60 inches in diameter, mounted equatorially. The optical and other refined parts of the last three instruments were made at the shops of the observatory in Pasa-



Sixty-inch Reflector with Cassegrain Spectrograph attached.

dena. These telescopes are supplied with various spectrographic, photographic, and other devices for studying the sun and similar stellar bodies.

In 1906, Mr. John D. Hooker, of Los Angeles, California, generously provided funds for the construction of a mirror 100 inches in diameter for an additional telescope of the reflecting type, and work on this enterprise is now progressing at the observatory shops.



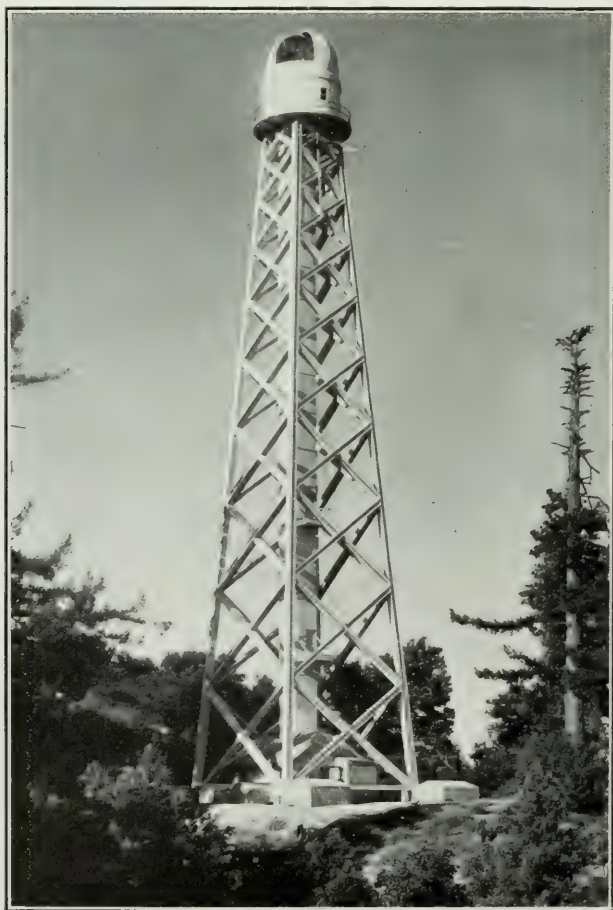
The Mount Wilson Observatory has the following equipment in buildings, in addition to various cottages, water reservoirs, store houses, and other minor structures:

AT PASADENA, CALIFORNIA.

- |                                 |                         |
|---------------------------------|-------------------------|
| 1. Office and Library building. | 3. Hooker optical shop. |
| 2. Instrument shop.             | 4. Physical laboratory. |

ON MOUNT WILSON.

- |   |   |
|---|---|
| 5. Steel building and dome for<br>60-inch reflector.  | 11. 10-inch photographic telescope<br>dome. |
| 6. Steel building and dome for<br>100-inch reflector. | 12. Astrophysical museum.                   |
| 7. Snow telescope.                                    | 13. Physical laboratory.                    |
| 8. 60-foot tower telescope.                           | 14. "Monastery."                            |
| 9. 150-foot tower telescope.                          | 15. Power house.                            |
| 10. 6-inch equatorial dome.                           | 16. Storage-battery house.                  |



150-foot Tower Telescope, Mount Wilson.

## DEPARTMENT OF ECONOMICS AND SOCIOLOGY.

*Chairman,* HENRY W. FARNAM.

*Address,* 43 Hillhouse Avenue, New Haven, Connecticut.

This Department was established in January 1904. Its work has been conducted by a staff of collaborators, each in charge of a division. At present the divisions and collaborators are as follows:

Population and Immigration, Walter F. Willcox, Cornell University.

Agriculture and Forestry, Kenyon L. Butterfield, Massachusetts Agricultural College.

Mining, Edward W. Parker, United States Geological Survey.

Manufactures, Victor S. Clark, Washington, D. C.

Transportation, B. H. Meyer, Member of Interstate Commerce Commission.

Domestic and Foreign Commerce, Emory R. Johnson, University of Pennsylvania.

Money and Banking, Davis R. Dewey, Massachusetts Institute of Technology.

The Labor Movement, John R. Commons, University of Wisconsin.

Industrial Organization, J. W. Jenks, New York University.

Social Legislation, Henry W. Farnam, Yale University.

Federal and State Finance, including Taxation, Henry B. Gardner, Brown University.

The Negro in Slavery and Freedom, Alfred Holt Stone, Dunleith, Mississippi.

This Department is engaged in the preparation of contributions to American economic history. Its plan of action was adopted on the recommendation of an advisory committee consisting of Carroll D. Wright, J. B. Clark, and Henry W. Farnam, whose report may be found in the Year Book for 1902. In 1903 Dr. Wright was appointed Director and the Department was organized. After the death of Dr. Wright, on February 20, 1909, Professor Farnam, who had previously acted as secretary of the board of collaborators, was appointed chairman of this board, and as such he has since had general charge of the affairs of the Department. From the outset, the project has been carried on with the cooperation of professors and students of economics and history in many universities.

As an aid to the collaborators, provision was made in December 1906 for the compilation and publication of an index of the economic materials in the public documents of the States of the United

States. This work has been carried on, under the auspices of the Department, by Miss Adelaide R. Hasse, of the New York Public Library, and volumes for the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, California, Illinois, Kentucky, Delaware, and Ohio have been published, while New Jersey is in press and Pennsylvania is ready for press. In addition to these volumes the Department has secured the preparation of about 240 articles, monographs, or books, of which about one-half have been published in whole or in part. The Documentary History of American Industrial Society, in eleven volumes, edited by John R. Commons and a group of scholars under the immediate direction of the Bureau of Industrial Research, aided by a grant of money from the Institution, also forms part of the material of this Department. A bibliography of these works, representing the cooperative efforts of about 290 authors, may be had on application to the Institution. The plan of the Department contemplates the issue of summaries for the several divisions, based on these preliminary studies, and several of these are now well advanced.



## DEPARTMENT OF HISTORICAL RESEARCH.

*Director*, J. FRANKLIN JAMESON.

*Address*, Woodward Building, Washington, D. C.

### PRESENT INVESTIGATORY STAFF.

EDMUND C. BURNETT.

FRANCES G. DAVENPORT.

ELIZABETH P. DONNAN.

WALDO G. LELAND.

CHARLES O. PAULLIN.

LEO F. STOCK.

In the summer of 1902, a committee of the American Historical Society submitted to the Institution a memorial suggesting methods for the promotion of historical research. This memorial was followed by a report of a special advisory committee on history, and in February 1903 a department of historical research was temporarily organized under the directorship of Professor A. C. McLaughlin. It was originally designated the Bureau of Historical Research. Professor McLaughlin continued his services as Director until October 1, 1905, when he resigned and was succeeded by Professor Jameson. At the same time the present designation of the Department was adopted.

This Department is chiefly occupied with the preparation of publications intended to assist investigators in American history. It issues reports, aids, and guides with respect to historical documents hitherto unclassified and relatively inaccessible. In addition to the sources of American history available in the United States, the sources in foreign archives are also being explored and catalogued. This work has already been extended to archives in Canada, Cuba, Mexico, Great Britain, France, Germany, Italy, Spain, Switzerland, Austria, Russia, and the Netherlands.

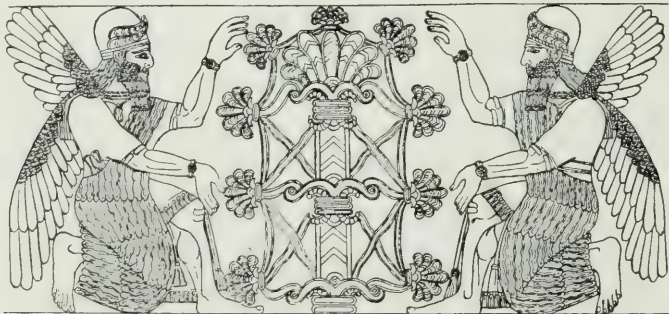
Besides these guides to sources, the Department is also preparing volumes of important material for American history, such as the American Proceedings and Debates in Parliament, Letters of Delegates to the Continental Congress respecting its Transactions, European Treaties having a bearing on American History, and an Atlas of Historical Geography of the United States.

## DIVISION OF RESEARCH ASSOCIATES.

The relations to the Institution sustained by Research Associates are so varied and so complex as to preclude summary specification. Each case presents conditions peculiar to itself. A few Research Associates are connected directly with the departments of research; many more are at work independently and by aid of subsidies granted annually or for a specified term of years; while others are temporarily allied to the Institution through the Division of Publications. It not infrequently occurs, also, that an individual may sustain the last two of these relations simultaneously. It should be stated in addition that nearly every Research Associate brings to this branch of the Institution's work several collaborators, so that the ramifications of the relations in question are not only very extensive, but they tend constantly toward an increasing complexity of administration. The range of activities of Research Associates is likewise very extensive; it is restricted only by the limited income of the Institution. Nearly all of the well-recognized fields of research, ranging



Frontispiece (greatly reduced) of H. C. Lancaster's "Pierre du Ryer, Dramatist," a contemporary and rival of Corneille. The reproduction is from the first edition of "Saul," 1642.



The Tree of Life. From William Hayes Ward's "Seal Cylinders of Western Asia." The cut at bottom of page 45, also from this book, relates to the same subject.

alphabetically from archeology and astronomy to thermodynamics and zoology, have been entered by one or more investigators, and their work has been carried on in many different countries. For example, archeological researches have been promoted in regions as widely separated as Turkestan, the shores of the Mediterranean, and the North American Continent. Similarly, subjects as widely different as chemistry, engineering, literature, meteorology, and paleontology have each been advanced by subsidies to one or more devotees.



The Atrium Vestae seen from the East. From Esther B. Van Deman's studies of Ancient Roman Construction.

Of the numerous branches of this division of activities, only a few may be cited here in illustration of the variety and extent of the investigations already published or now under way. A glance at the Institution's list of publications shows numerous contributions to chemistry from Professors Jones, Morse, Noyes, Richards, and others. Mathematical science is represented by the collected mathematical works in celestial mechanics of the late George William Hill, and by the factor tables and tables of primes of D. N. Lehmer. In



the field of international law several volumes of a series of "Classics of International Law" have been issued under the general editorship of Professor James Brown Scott in collaboration with such eminent authorities as Westlake and Holland of England, von Bar of Germany, Nys of Belgium, and de Lapradelle of France, to mention only those who have contributed to the volumes of the series already published. Complete translations of the texts are made by distinguished classical scholars, including J. L. Brierly, John Pawley Bate, and John D. Maguire. To early English and Continental literature there has been contributed an edition, in seven quarto volumes,

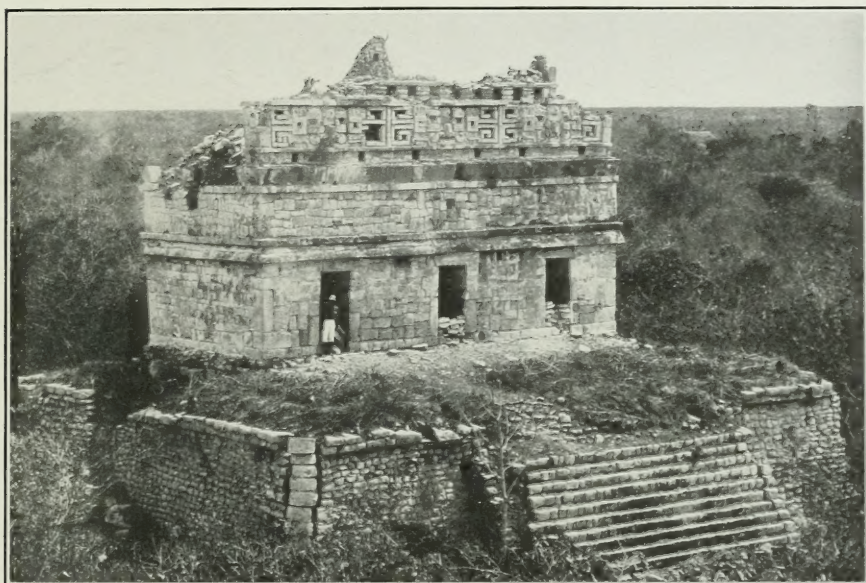


Hugo Grotius, 1583-1645.

Author of *De Jure Belli ac Pacis*, the First Systematic  
Treatise on International Law.

of the "Arthurian Romances" by Dr. H. Oscar Sommer, printed in French of about the fifteenth century; while our knowledge of the Polynesian group of languages has been enlarged by the publication of four volumes of researches by Mr. William Churchill. The little-understood science of the weather has been given a new foundation and a new superstructure by Professor Bjerknes in his "Treatise on Dynamic Meteorology and Hydrography," published by the Institution. Among many enterprises under way may be

mentioned Dr. Erwin F. Smith's exhaustive studies of bacteria in relation to plant diseases; the chemico-physical studies of Professors Osborne and Mendel in animal nutrition; the stereochemical studies, in relation to genera, species, etc., of Dr. Reichert; the



The Casa Colorada, said to be the best preserved building in the Maya Region of Central America. The Maya civilization flourished during the first fifteen centuries of the Christian Era. The Casa Colorada dates from about 1200 A. D. From S. G. Morley's Report.

researches of Dr. Castle in heredity; the investigations of Professor Chamberlin and his colleagues in geology and cosmogony; and the current bibliography of medical science published in the *Index Medicus* under the direction of Dr. F. H. Garrison.





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**STORAGE**

